

# Hurricanes -

## Thoughts on Causes and Possible Mitigations, with Notes on an Insurance Industry View After Hurricane Katrina.

### Author

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As just about everyone knows, hurricanes in the western hemisphere (typhoons in the eastern) are fascinating as well as devastating to people, structures, habitats, urban and rural areas, and insurance companies. If you live or work in the US's Gulf of Mexico region, you've likely heard hurricane or tropical cyclone warnings on radio, television and smart phones, and perhaps tracked their progress on seasonal charts from paper market-shopping bags.

Hurricanes are caused by high winds over warm-surfaced seawaters, which expand and rapidly evaporate, giving rise to an atmospheric vortex that surrounds a tumbling eye and expands upwards and outwards to form an inverted cone of high wind and heavy rains. Tropical waters are generally warmer than others, and so are more susceptible to hurricanes than are other seas. Sometimes, hurricanes batter the coasts and even inland areas for hundreds to thousands of miles after they make landfall. They may even linger over an area for several days or weeks as did Category 5 Hurricane Harvey in September 2017 over southeast Texas, including metropolitan Houston, causing \$125 billion in damage and 68 human fatalities. Hurricanes also may erode flood control structures and overtop lakes, canals and drainages as was observed twelve years earlier in Category 5 Hurricane Katrina (August 2005) in an area stretching from greater New Orleans, LA, to the Florida panhandle. This event also caused \$125 billion in damage as well as 1,833 fatalities. Even milder hurricanes like the Category 3 Hurricane Sandy that hit metropolitan New York in October-November 2012 caused nearly \$70 billion in damage and 106 fatalities. By comparison, the Category 4 Super-Durian Typhoon of November-December 2006 in Vietnam, Thailand, Philippines, Malaysia and Vap caused over \$530 million in damage and 1,399 fatalities.

There is no current technology to stop the wind, the warming of surface seawater, the rapid seawater evaporation, or the vortex and cone and its winds and rains. I suppose someday we might just possibly figure out how to monitor and control atmospheric winds and surface sea temperature, to cool down the sea surface temperatures, or to mitigate surface seawater expansion, evaporation and resultant hurricanes.

But the sad reality is: hurricanes are not mitigatable. However, their adverse impacts can be reduced by several means:

- Upgrade, operate and maintain early warning systems and evacuation networks
- Establish, operate and maintain emergency centers and shelters. Carry out regular training drills, and make provisions for counseling and grief management;
- Buy out developed land and its property owners, and return it to natural or enhanced drainage, especially urban and peri-urban historically impacted lands;
- Install rolling hills, berms, and flood detention and groundwater recharge basins;
- Recontour drainages and levees;
- Restore and/or establish wetlands and offshore barrier islands;
- Upgrade canal and drainage pumping and dewatering systems;
- Replace the existing surfaces of roadways, parking lots and driveways with water-permeable materials, and use them in constructing new such surfaces ;
- Upgrade codes to keep constructed permanent structures from the historical impacted areas and well above the historical flood levels.

But these measures are hardly curative especially during a catastrophic hurricane or even extreme flood event.

Hurricanes over the past five to ten years have been no more frequent than in any previously recorded five to ten years. In fact, there have been fewer hurricanes over the past five to ten years than normal even though atmospheric temperatures are higher. There are more hurricanes during colder global temperatures than during warmer global temperatures. Also, hurricanes are enhanced in terms of frequency, extent and effect due largely not to the heating of the earth's atmosphere per se but the heating and expansion of the sea surface which makes the expanded seawater more susceptible to high winds and creating of vortexes and hurricanes (Helfand, 2019).

Hurricanes have always been fascinating as well as devastating. For example, the December 2007 holiday meeting of the Groundwater Association of California's Sacramento Branch was co-hosted with AEG at Sudwerk in Davis. According to HydroVisions (quoted and paraphrased for clarity below):

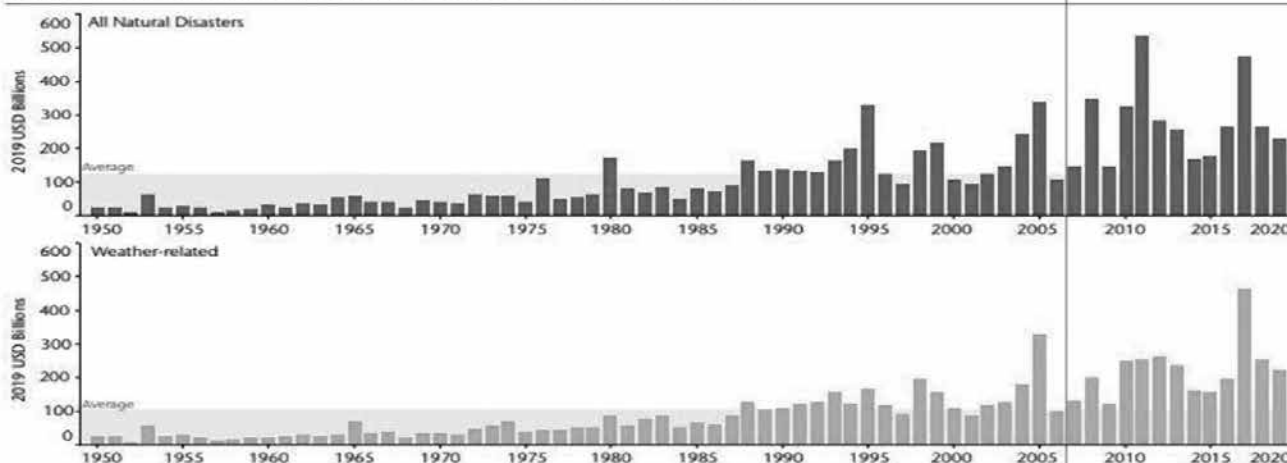
About 100 attendees saw a sobering presentation by Dr. Raymond Seed, entitled "New Orleans Levee Performance in Hurricane Katrina: Lessons for California's Levee Situation." Dr. Seed is a Professor of Civil and Environment Engineering at University of California, Berkeley and led a National Science Foundation-sponsored team that completed a forensic analysis of the levee failures resulting from Hurricane Katrina. Their findings showed that although most of the levee failures in the central New Orleans area were thought to be the result of overtopping, many key failures were related to poor foundation soils that underlie the levees. The investigation team made recommendations to improve the performance of the levees, and provided insights and recommendations for

mitigating potentially serious deficiencies in the emergency repairs at a number of breached sections. Dr. Seed discussed the precarious situation in northern California, where most levees are constructed of natural fine-grained clayey materials dredged from rivers and are structurally unsound. This could lead to devastation exceeding that observed in New Orleans.

Another note from Hurricane Katrina is drawn from a World Affairs Council-sponsored talk by Lord Peter Levene, given at the National Press Club in Washington, DC (January 12, 2007). He was the Chairman of Lloyd's of London, and in charge of paying the insurance claims resulting from Katrina. One might ask why it is worth printing my notes from a talk given thirteen years ago about the world insurance industry's recognition of the increasing costs of natural disasters – a talk which attributes a large part of that cost to global warming. The speaker noted that we were not having a serious policy debate about this in the USA in 2007, when the world's insurers could already see the effects on their bottom line, especially in

## Appendix B: Long-term Natural Disaster Trends

**Exhibit 49: Global Economic Losses from natural disasters since 1950**



**Exhibit 50: Cumulative Global Economic Losses by peril since 1950**

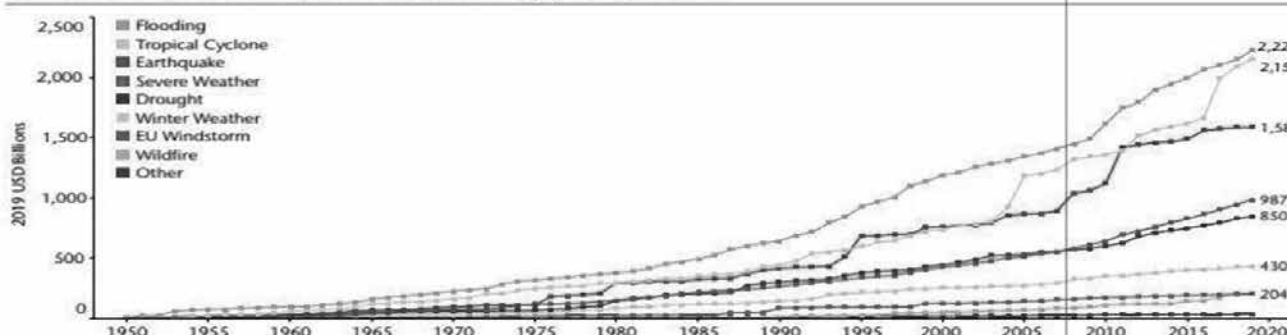


Figure 1 - Increasing costs of natural disasters, especially those related to weather, from 1950 to the present.  
Note in Exhibit 50 that cumulative losses are climbing exponentially, and that flooding and hurricane costs are rising fastest.

the USA. We are still not having that debate, but I present here three tables (Fig.1) from the Aon insurance company's 2019 Annual Report "Weather, Climate and Catastrophe Insight" that show that the costs continue to climb, and that seven of the eight top loss-makers are weather-related, with flooding and hurricanes damages increasing far faster than all other catastrophe types. Therefore it is interesting to look back to 2007 (vertical red line on Fig.1) and realize how much was already then understood. If anything, costs of natural disasters have risen more steeply on average since 2007 than they had before.

## My notes from the meeting are as follows:

Lord Peter Levene, Chief Executive Officer, Lloyd's of London on "Insurance Industry Catastrophe Trends and Climate Change" noted several recent reports that have drawn attention to climate change challenges. Nicolas Stern, in the British Treasury's Stern Review of Global Warming says "according to the worst-case scenario, the global economy may shrink by 20 % and generate 200 million refugees." To an attentive 125 attendees, Lord Levene made the following remarks and responded to questions. "We live today in changing times – droughts, famines, terrorism. No lack of crises. If we fail to act now, we put the world at risk for great damage from climate change. Lloyd's works to understand risk trends, and underwrites \$12 billion insurance in the U.S., the world's largest insurance market, increasing at \$2 billion per year. Three key issues: 1) Is the U.S. in denial, facing up to \$100 billion, twice that of Hurricane Katrina, in insurance industry payouts related to natural disasters? 2) Is the insurance industry strong enough to protect the insured from Mother Nature? 3) What action can we take on global climate change? Because there are sound reasons to take action.

1. Though the 2006-hurricane season was the third mildest in over 60 years, weather-related catastrophes are causing the insurance industry's highest losses ever – 2005 was the worst year, with over \$85 billion in claims, 80 % from U.S. hurricanes. The North Atlantic Ocean entered a new cycle in the 1990s, these cycles typically last 30 years; expect severe hurricanes over the next 10+ years. The ten warmest years on record have been since 1995. No one in the insurance industry now denies global climate change. Now, increasingly accurate short-term weather predictions see longer storm seasons that cover larger areas than ever. The U.S. coast has \$7 trillion in assets, especially in New York and Florida. Two years after Katrina and 2 years before the next U.S. presidential election, where is the debate in the U.S. on climate change? Lloyd's believes that a \$100 billion natural catastrophe can now happen anywhere on the U.S. Atlantic coast. Lloyd's believes there needs to be open discussion now and extreme action on land use: building codes must be improved and other mitigations must occur. If Florida were to meet better building and location standards, natural disaster damages would be reduced to half of what they were in 1992. Society's stakes have never been higher. The tragedy would be the occurrence of a loss ten- times larger than that due to Katrina. Lloyd's is forming a high-level task force to lead the debate.

2. U.S. insurance mechanisms are strong but can only continue if free markets continue. Yet, there are calls for windfall taxes. The U.S. insurance industry employs 1.2 million people (one in 50), contributes 15 % to the national domestic product, and in 2005, paid out \$1.3 billion per day in claims. It settled 95 % of all claims within a year of Katrina. Claims are expected to be lower in 2006 because of the third calmest hurricane season in six decades, which balances out the highest claims of 2005. For the Fortune 500 companies, the average return on investment is about 14 %; the insurance industry trails this with peak performance one in ten years. The peak represents restorative period to balance years of insurance industry losses. The 9/11 event had \$7 billion in claims. In the last 30 years, the U.S. insurance industry lost \$400 billion. Catastrophe losses are rising rapidly. To cover all claims, there must be sufficient funds. Insurance operates most efficiently when left to free-market forces. The global insurance industry is well equipped to insure the U.S., and to model risk and spread risk from natural disasters. Terrorist risk is best managed by private/public partnerships, but natural disaster insurance pricing should be free market and risk based. The insurance market is highly internationalized. Lloyd's paid \$6 billion from Katrina. About 80 % of U.S. insurance is covered by foreign reinsurance. Lloyd's is concerned that U.S. insurance will be left behind because of state constraints which work counter to markets, have discriminating rules, and require 100 % of equity as collateral. If \$8 billion is locked up in collateral cash for international insurance, it is not doing any good. This large equity requirement is not imposed on U.S. firms, but only on foreign firms. The entire insurance industry should be free market, risk based, fair, and transparent.
3. In July 2006, 200 business leaders attended a London conference and agreed that we can only make progress if there is commitment from every major country. Many U.S. States and local governments are working to cut greenhouse gases per Kyoto Accords. In the U.S., only 80 % of leaders are committed; 90% say companies that take climate change seriously have a competitive business advantage. DuPont slashed CO2 gas releases while increasing production. Kraft ice cream plants did the same. For financial strength, reputation... these trends will continue. 92% of conference attendees agreed that more energy efficiency - turning green – is good business. Lloyd's insures one fourth of the world's wind farms to provide clean, renewable energy with no impact on climate change.

We must agree to deal with climate change if we want to leave a healthy planet to future generations. We need to rethink global public policies based on facts and risks, and coordinate market-based action on climate change. The insurance industry can play a good role in climate-change risk management. Even if we stop generating greenhouse gases now, we will see the effects in 30 years. Some of the biggest players – China, India, and the U.S. – have not signed on to the Kyoto Accords.

## RESPONSES TO QUESTIONS

**Why are some U.S. insurance companies withdrawing from U.S. coastal markets?** Where there are major costs from damage claims, insurance rates must go up to cover them. Insurance companies can't print money; they are not the government. If the industry can't make commercially acceptable returns on its practice, and can only turn losses every year, it withdraws from those markets.

**Doesn't insurance profit investment cover extreme events?** No way. Cumulative investment funds are pretty stable, static. When there are new, large insurance claims, the only way to cover them is through premiums. The static investments don't generate enough cash flow to cover large claims.

**What about social responsibility?** All annual UK company reports require a section on social responsibility. Major investing institutions now pay attention to the social responsibility demonstrated by firms, not only financial performance.

**What does the recent "Green development" book say?** It points out that businesses have the business advantage to "green" development, dah. For meaningful actions by corporations, major investment institutions review the "greenness" of corporations in the UK.

**Do you have recommendations to accommodate political pushback?** The evidence of climate change is now overwhelming. The number and significance of serious players who acknowledge climate change is rapidly growing, even if it is inconvenient to believe it.

**Why should companies behave in an environmentally responsible way?** If we do environmentally responsible work through pollution reduction, it will be a good thing in itself for human health and welfare directly, regardless of reduction of climate change extremes. A lot of people don't believe it, and say it's a waste of money to address climate change. The politics of it is knotty, and needs orientation, education, promotion of sound environmental management.

**What can be done to improve buildings in the East coast?** Encourage modern building designs and siting on the U.S. Atlantic coast. It can be done if buildings meet the new codes, their insurance rates should go down.

**Do other insurance lines offset natural disaster insurance?** The industry can't really have cross-subsidization. It can't raise automobile insurance to cover wind storm losses. Some offsets are possible – say New Zealand earthquake insurance is offset by global terrorism insurance.

**Do poor countries suffer from lack of insurance?** Yes. Small and poor countries generally don't have insurance, like in Central and South America. This is likely to remain so. Consider that 3,000 people were killed in 9/11 and insurance was in play; while 227,898 died in the Aceh

tsunami with no effect on the insurance industry as none were insured. The Chinese insurance market is growing rapidly; 25 years ago, China was a poor, undeveloped country with no insurance industry.

**Who insures man-made catastrophes?** Government insurance often covers man-made events like terrorism, anthrax releases. The insurance industry works with public-private partnerships in such events.

**Would the insurance industry invest in restoring coastal areas?** The industry gets income from sales and couldn't afford to restore coasts. This should be done by the public sector.

**What is the reinsurance risk/elasticity of reinsurance markets?** Reinsurance risk is significant. The world insurance industry is huge and survives by balancing worldwide risks under commercially acceptable terms.

## References

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## About the Author

Barney Paul Popkin is retired and was a CPG, California Registered Environmental Assessor and Professional Geologist, and Georgia and European Federation Geologist. He has worked on hurricane recovery and reconstruction assignments in Houston's 2017 Hurricane Harvey through FEMA, Cul-de-Sac/Haiti's 2008 Triple Hurricanes and Bicol, Philippines' 2006 Super-Durian Typhoon through USAID. He also worked on similar assignments for South East Asia's 2004 Boxing Day Tsunami, Kashmir/Pakistan's 2005 Earthquake and Port-au-Prince/Haiti's 2010 Earthquake through USAID. Mr. Popkin participated in several hurricane conferences, workshops and briefings in South East Asia and Washington, DC. As a USGS Texas District Hydrologist in the 1960s, he personally experienced the tail ends of several Texas Gulf Coast hurricanes during which he gaged streams in hand-drawn cable cars and crossed flooded bridges with caution, accumulating many memorable experiences.

